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478. Proposed by J. A. CAMPBELL, St. Johnsbury, Vt.

Construct a triangle having given the difference of the segments of the base formed by the foot of the perpendicular from the vertical angle, the difference of the base angles, and the sum of the three sides.

CALCULUS.

397. Proposed by C. N. SCHMALL, New York City.

On the radii vectores of one loop of the lemniscate, $\rho^2 = a^2 \cos 2\theta$, as diameters, circles are described, passing through the pole. Find the locus of their points of intersection and show that its area is twice that of the loop.

398. Proposed by V. M. SPUNAR, Chicago, Ill.

Solve

$$2\frac{\partial^2 z}{\partial x^2} - 3\frac{\partial^2 z}{\partial x \partial y} - 2\frac{\partial^2 z}{\partial y^2} = 0.$$

Proposed by EMMA GIBSON, Drury College.

Solve the differential equation,

$$(x^3y^3 + x^2y^2 + xy + 1)y + (x^3y^3 - x^2y^2 - xy + 1)\, x\frac{dy}{dx} = 0.$$

From Forsyth's *Differential Equations*, p. 48, Ex. 1, XXIV.

399. Proposed by B. J. BROWN, Victor, Colorado.

A cow is tethered by a perfectly smooth rope, a slip noose in the rope being thrown over a large square post. If the cow pulls the rope taut in the direction shown in the figure, at what angle will the rope leave the post?

From Granville's *Diff. and Int. Calculus*, p. 120, Prob. 55.

MECHANICS.

317. Proposed by CLIFFORD N. MILLS, Brookings, South Dakota.

Show that the maximum area contained between the path of a projectile and the horizontal line is $\frac{v^2\sqrt{3}}{8g^2}$, where v is the velocity of projection.

318. Proposed by C. N. SCHMALL, New York City.

Given an inclined plane making an angle ϕ with the horizontal. A perfectly elastic ball is projected upward at an angle ψ with the inclined plane, so as to ascend it by bounds. Show that as the ball rebounds for the nth time, the angle of inclination of its path to the plane is

$$\tan^{-1}\left(\frac{\tan\psi}{1 - 2n\tan\phi\tan\psi}\right);$$

and if it rebounds vertically upward, then $\cot\psi = (2n + 1)\tan\phi$.

NUMBER THEORY.

235. Proposed by W. D. CAIRNS, Oberlin College.

Prove that $n = 1$ is the only positive integer for which $n^4 + 4$ is a prime.

236. Proposed by V. M. SPUNAR, Chicago, Illinois.

Find integral values of x, y, z, such that

$$xy + z = \square, \qquad yz + x = \square, \qquad \text{and} \qquad xz + y = \square.$$